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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/591,663	12/22/2006	Junichiro Kawamoto	295893US8X PCT	3123

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EXAMINER	
DEAN, JR, JOSEPH E	

ART UNIT	PAPER NUMBER
2617	

NOTIFICATION DATE	DELIVERY MODE
10/14/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/591,663	KAWAMOTO ET AL.	
	Examiner	Art Unit	
	JOSEPH DEAN, JR	2617	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 June 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7 and 10-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 10-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 06/11/10 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 2, 3, 6, 7, 13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable by Onggosanusi et al. (US20030139139) (hereinafter Onggosanusi), Juntti et al. (20030179814) (hereinafter Juntti) Miyoshi et al. (US20030067971) (hereinafter Miyoshi) and in view of Sugimoto et al (US6661835) (hereinafter Sugimoto).

Per claim 1, Onggosanusi discloses a receiving apparatus using a CDMA method for receiving signals by N receiving antennas (N is a positive integer), the signals being transmitted by M transmitting antennas (M is a positive integer)

(paragraph 0007), comprising: serially coupled multipath receiving signal demodulating units for primary demodulation of the signals received by the receiving antennas (paragraph 0005), for estimating the signals transmitted from the transmitting antennas (paragraphs 0017 ,0018 and 0024), and for obtaining a received signal of each path of the receiving antennas in a multipath environment based on the estimated signals (paragraph 0005); serially coupled multipath interference canceling units for deducting the obtained signals received through the paths other than a target path from the signals received by the receiving antennas to obtain multipath interference cancelled signals (paragraph 0034-0038);

wherein the multipath receiving signal demodulating units (paragraph 0005) and the multipath interference canceling units (paragraph 0016) are serially arranged in stages (paragraph 0050), a receiving signal received at each of the receiving antennas is directly inputted to all the serially coupled corresponding multipath interference canceling units without having passed through any of the other multipath interference canceling unit, each of the stages other than the first stage updates a channel coefficient estimated based on a known pilot signal transmitted from the M transmitting antennas using a multipath interference cancelled signal provided by a multipath interference canceling unit in an upper stage.

Onggosanusi fails to disclose a demodulating unit for secondary demodulation of the multipath interference cancelled signals.

However, Juntti discloses a demodulating unit for secondary demodulation of the multipath interference cancelled signals (paragraph 0071).

Both Onggosanusi and Juntti fail to disclose paragraph outlined below, however Miyoshi discloses a receiving signal received at each of the receiving antennas is directly inputted to all the serially coupled corresponding multipath interference canceling units without having passed through any of the other multipath interference canceling unit (paragraph 0050, 0051and Fig 4), but fails to disclose each of the stages other than the first stage updates a channel coefficient estimated based on a known pilot signal transmitted from the M transmitting antennas using a multipath interference cancelled signal provided by a multipath interference canceling unit in an upper stage.

Sugimoto discloses each of the stages other than the first stage updates a channel coefficient estimated based on a known pilot signal (col.18 lines 30-35, col. 21 lines 7-23 and col. 23 lines 53-57) transmitted from the M transmitting antennas using a multipath interference cancelled signal provided by a multipath interference canceling unit in an upper stage (col.31 lines 21-34).

Therefore, one skilled in the art would have found it obvious from the combined teachings of Onggosanusi provides closed loop MIMO scheme, Juntti provides estimation of spreading and interference signals, Miyoshi provides interference cancellation methods and Sugimoto provides CDMA system with improvement to interference cancellation abilities as a whole to produce the invention as claimed with a reasonable expectation of achieving a quality signal with less disturbance.

Per claim 2, the combination discloses the receiving apparatus as claimed in claim 1, Onggosanusi discloses wherein the multipath receiving signal demodulating

units carry out the primary demodulation using a minimum mean square error (MMSE) method (paragraph 0038).

Per claim 3, the combination discloses the receiving apparatus as claimed in claim 1, Onggosanusi discloses wherein the multipath receiving signal demodulating units carry out the primary demodulation using a maximum likelihood detection (MLD) method (paragraphs 0034 and 0037).

Per claim 6, the combination discloses the receiving apparatus as claimed in claim 2, Onggosanusi discloses wherein the multipath receiving signal demodulating units control an amplitude of the signal received (paragraph 0021), based on a probability of correctness of a transmission symbol sequence estimated using the minimum mean square error (MMSE) method (paragraphs 0023 0038 and 0066).

Per claim 7, the combination discloses the receiving apparatus as claimed in claim 2, as applied to claim 1, wherein Sugimoto the multipath receiving signal demodulating units estimate a channel coefficient using a known pilot signal transmitted from the M transmitting antennas(col. 18 lines 30-35, col. 21 lines 7-23 and col. 23 lines 53-57).

Therefore, one skilled in the art would have found it obvious from the combined teachings of Onggosanusi, Juntti, Miyoshi and Sugimoto as a whole to produce the invention as claimed with a reasonable expectation of achieving known variable for sequencing for overall consistency in performance.

Per claim 13, the combination discloses the receiving apparatus as claimed in claim 1, Onggosanusi discloses wherein when the signals transmitted from the M transmitting antennas are code-multiplexed signals (paragraphs 0004 and 0007), the

multipath receiving signal demodulating units perform the primary demodulation of the signals received by the corresponding receiving antennas (paragraph 0005), and obtain the signals of the corresponding paths for all the receiving antennas for all spreading signals (paragraphs 0004 and 0005) a, the multipath interference canceling units deduct the obtained signals corresponding to all the spreading signals received through the paths other than a target path from the signals received by the receiving antennas to obtain multipath interference cancelled signals (paragraphs 0034-0038),

Onggosanusi fails to disclose the demodulating unit performs the secondary demodulation of the multipath interference cancelled signals for each of the spreading signals.

However, Juntti discloses the demodulating unit performs the secondary demodulation of the multipath interference cancelled signals for each of the spreading signals (paragraph 0071).

Therefore, one skilled in the art would have found it obvious from the combined teachings of Onggosanusi, Juntti, Miyoshi and Sugimoto as a whole to produce the invention as claimed with a reasonable expectation of achieving lower noise ratio.

Per claim 15, the combination discloses a radio communications system, comprising: the receiving apparatus as claimed in claim 1; Onggosanusi discloses transmitting apparatus including the M transmitting antennas (M is a positive integer) for transmitting a CDMA signal from each of the transmitting antennas (paragraph 0007).

4. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable by Onggosanusi et al. (US20030139139), Juntti(US20030179814) and Sugimoto (US6661835) in view of Walton et al. et al. (20040082356) (hereinafter Walton).

Per claim 4, the combination discloses the receiving apparatus as claimed in claim 1, Onggosanusi discloses wherein the multipath receiving signal demodulating units carry out the primary demodulation using a maximum likelihood detection method (paragraphs 0034 and 0037), but fails to disclose using QR factorization on a block of a plurality of the paths.

However, Walton discloses using QR factorization on a block of a plurality of the paths (paragraphs 0327 and 0487).

Motivation to combine may be gleaned from the prior art contemplated. Therefore, one skilled in the art would have found it obvious from the combined teachings of Onggosanusi, Juntti, and Walton provides MIMO WLAN system that employs MIMO, OFDM and TDD as a whole to produce the invention as claimed with a reasonable expectation of achieving better organization of data while supporting multiple users.

Per claim 5, refer to same rationale explained in claim 4 (QR factorization includes various methods including Gram-Schmidt).

5. Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable by Onggosanusi et al. (US20030139139) (hereinafter Onggosanusi) and Juntti in view of Song et al. (20040120415) (hereinafter Song).

Per claim 10, the combination discloses the receiving apparatus as claimed in claim 1; the combination fails to disclose wherein the demodulating unit performs the secondary demodulation using a maximum likelihood detection method.

However, Song discloses disclose wherein the demodulating unit performs the secondary demodulation using a maximum likelihood detection method (paragraph 0013).

Therefore, one skilled in the art would have found it obvious from the combined teachings of Onggosanusi, Juntti, Miyoshi, Sugimoto and Song provides maximum likelihood detection to overcome the effects of fading or signal interference as a whole to produce the invention as claimed with a reasonable expectation of achieving less noise and interference.

Per claim 11, the combination discloses the receiving apparatus as claimed in claim 1, the combination fails to disclose wherein the demodulating unit performs the secondary demodulation using a maximum likelihood detection method using QR factorization on a block of a plurality of the paths.

However, Song disclose wherein the demodulating unit performs the secondary demodulation (paragraph 214, fig 7) using a maximum likelihood detection method using QR factorization on a block of a plurality of the paths (paragraphs 327and 673)

Therefore, one skilled in the art would have found it obvious from the combined teachings of Onggosanusi, Juntti, Miyoshi, Sugimoto and Song as a whole to produce the invention as claimed with a reasonable expectation of achieving organization of data.

Per claim 12, refer to same rationale explained in claim 11(QR factorization may be performed by various methods (paragraph 0487 by Song, which takes into account each path)

6. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable by Onggosanusi (US20030139139), Miyoshi (20030067971) in view of Sugimoto (US6661835).

Per claim 14, Onggosanusi discloses a receiving method of a receiving apparatus for receiving a plurality of signals using a CDMA method (paragraphs 0004 and 0017), the signals being transmitted from M transmitting antennas (M is a positive integer) and received by N receiving antennas (N is a positive integer) (paragraph 0007 i.e. also review Onggosanusi claim 1 where integers are positive for antennas), comprising: ~~a~~ receiving the signal received by each of the receiving antennas (paragraph 0023),estimating, at a plurality of serially coupled multipath receiving signal demodulating units (paragraphs 0035-0037), the signal transmitted from each of the transmitting antennas using a predetermined algorithm (paragraphs 0035-0037) ; multiplying, at the serial coupled multipath receiving signal demodulating units the estimated transmitted signal (paragraph 0069, 0075 and 0076) and obtaining the received signal of each path for each of the receiving antennas in a multipath environment (paragraph 0005); deducting, at a plurality of serial coupled multipath interference canceling units (paragraph 0066), the obtained received signals of the paths other than a target path from the signal received by each of the receiving antennas (paragraph 0024); and a step of demodulating the signals that are obtained by the step of deducting (paragraph 0005); wherein the multipath receiving signal demodulating units (paragraph 0005) and the multipath interference canceling units (paragraph 0016) are arranged in stages (paragraph 0050), but fails to disclose a

receiving signal received at each of the receiving antennas is directly inputted to all the serially coupled corresponding multipath interference canceling units without having passed through any of the other multipath interference canceling unit, each of the stages other than the first stage updates a channel coefficient estimated based on a known pilot signal transmitted from the M transmitting antennas using a multipath interference cancelled signal provided by a multipath interference canceling unit in an upper stage.

Miyoshi discloses receiving signal received at each of the receiving antennas is directly inputted to all the serially coupled corresponding multipath interference canceling units without having passed through any of the other multipath interference canceling unit (paragraph 0051, 0054 and fig 4) but fails to disclose each of the stages other than the first stage updates a channel coefficient estimated based on a known pilot signal transmitted from the M transmitting antennas using a multipath interference cancelled signal provided by a multipath interference canceling unit in an upper stage.

Sugimoto discloses each of the stages other than the first stage updates a channel coefficient estimated based on a known pilot signal (col.18 lines 30-35, col. 21 lines 7-23 and col. 23 lines 53-57) transmitted from the M transmitting antennas using a multipath interference cancelled signal provided by a multipath interference canceling unit in an upper stage (col.31 lines 21-34).

Therefore, one skilled in the art would have found it obvious from the combined teachings of Onggosanusi, Miyoshi and Sugimoto as a whole to produce the invention as claimed with a reasonable expectation of achieving less delays and errors.

Contacts

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOSEPH DEAN, JR whose telephone number is (571)270-7116. The examiner can normally be reached on Monday through Friday 7:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bost Dwayne can be reached on 571-272-7023. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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